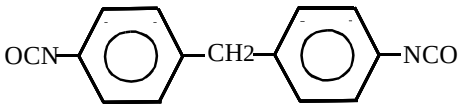
METHYLENE DIPHENYL DIISOCYANATE

Methylene diphenyl diisocyanate is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 101-68-8

Molecular Formula: $C_{15}H_{10}N_2O_2$



Methylene diphenyl diisocyanate (MDI) is a light yellow, fused solid. It is soluble in acetone, benzene, and kerosene. MDI is also combustible (Sax, 1987).

Physical Properties of Methylene Diphenyl Diisocyanate

Synonyms: diphenylmethane-4,4'-diisocyanate; MDI; methylene-di-p-phenylene isocyanate; methylene bisphenyl isocyanate

Molecular Weight:	250.27
Boiling Point:	196 °C at 5 mm Hg
Melting Point:	37.2 °C
Density/Specific Gravity:	1.197 at 70 °C (water = 1)
Vapor Pressure:	0.001 mm Hg at 94 °C
Conversion Factor:	1 ppm = 10.2 mg/m^3

(HSDB, 1991; Sax, 1987)

SOURCES AND EMISSIONS

A. Sources

Methylene diphenyl diisocyanate is used for bonding rubber to rayon and nylon and as a chemical intermediate for polyurethane coatings, elastomers, thermoplastic resins, spandex fibers, and millable gums (HSDB, 1991). The primary stationary sources for emissions of methylene diphenyl diisocyanate in California include manufacturers of metalworking machinery, household furniture, and electronic components and accessories (ARB, 1997b).

B. Emissions

The total emissions of methylene diphenyl diisocyanate from stationary sources in California were at least 18,000 pounds per year based on data obtained from the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

No information about the natural occurrence of methylene diphenyl diisocyanate was found in the readily-available literature.

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of methylene diphenyl diisocyanate.

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of methylene diphenyl diisocyanate was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Based on the vapor pressure cited, methylene diphenyl diisocyanate will exist in the particle phase in the atmosphere, and hence subject to wet and dry deposition. The average half-life and lifetime for particles in the troposphere is estimated to be about 3.5 to 10 days and 5 to 15 days, respectively (Atkinson, 1995; Balkanski et al., 1993).

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics "Hot Spots" Program (AB 2588). Of the risk assessments reviewed as of April 1996, methylene diphenyl diisocyanate contributed to a total cancer risk in 1 of the approximately 550 risk assessments reporting a total cancer risk greater than or equal to 1 in 1 million (OEHHA, 1996a).

HEALTH EFFECTS

Probable routes of human exposure to methylene diphenyl diisocyanate are inhalation and dermal contact.

Non-Cancer: Methylene diphenyl diisocyanate is highly irritating to the eyes and respiratory tract. It is a potent respiratory tract sensitizer and may also cause skin sensitization. Chronic inhalation exposure has caused shortness of breath, asthma, and other respiratory impairments in workers (U.S. EPA, 1994a).

The United States Environmental Protection Agency (U.S. EPA) has established a Reference Concentration (RfC) of 2×10^{-5} milligrams per cubic meter, based on hyperplasia of the olfactory epithelium in rats, and has not set an oral Reference Dose (RfD). The U.S. EPA

estimates that inhalation of the RfC or less, over a lifetime, would not likely result in the occurrence of chronic non-cancer effects (U.S. EPA, 1994a).

No information is available on adverse reproductive or developmental effects of methylene diphenyl diisocyanate in humans or animals (U.S. EPA, 1994a).

Cancer: No information is available on the carcinogenic effects of methylene diphenyl diisocyanate in humans or animals. The U.S. EPA has not classified methylene diphenyl diisocyanate for carcinogenicity (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified methylene diphenyl diisocyanate in Group 3: Not classifiable as to human carcinogenicity (IARC, 1987a).